

PERRY (G.H.)

ASTIGMATISM,
ACCORDING TO, AND CONTRARY TO THE RULE.

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ASTIGMATISM.—ACCORDING TO, AND CONTRARY TO THE RULE.

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That astigmatism contrary to the rule, produces more ill results, both immediate and remote, and is much more difficult to correct than astigmatism according to the rule, is well known; but so far as the writer is aware, the mechanism of these conditions has not been worked out.

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No. 5.

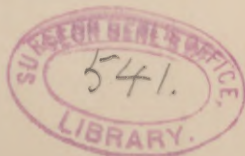
40 inches.

When the head is in natural poise, the chin will be held in even line, neither lifted nor depressed, the eyes looking straight forward, in military order, touching paces in front. Try it, beginning with the left of the chest. If one is free from ruffle of feeling the face shows the calm of repose, the eye the quiet depth of unstirred thought—the normal expression. This should be induced by every woman many times each day, if she would keep her youth, freedom from anxiety, perfect placidity, and smoothness; whether it be in the afternoon siesta, or the dropping of brain work now and then through the day, it relieves the contractions of muscles, brings relaxation and rest, and, above all, keeps off wrinkles, those dreadful experience-lines that come with heavy cares and continued set of muscles.

Fig. 1.—Emmetropia.

The object of this paper is to make a few suggestions which may aid some more able experimenter in the elucidation of this problem.

When a convex cylindrical lens of 2 D. is placed before an emmetropic eye, with its axis horizontal, the eye is rendered astigmatic according to the rule, and the vertical lines on the clock



face test card, or in print, are black and clear, while all lines that are not perpendicular are blurred (Fig. 3). By closing the eyelids so as to leave only a narrow space between them, all the lines become black, distinct and clear. That this correction is not due to a change in the curve of the cornea, or to any change in the crystalline lens is proved by holding a narrow slot horizontally before the wide open eye and thereby producing the same result. (Compare Figs. 1 and 7.) The fact, also, is noted that no person during an ophthalmometric examination has been able, by any movement of the eyelids, or by any muscular contraction in, or about the eye, to change the curve of the cornea as much as a quarter of a dioptré.

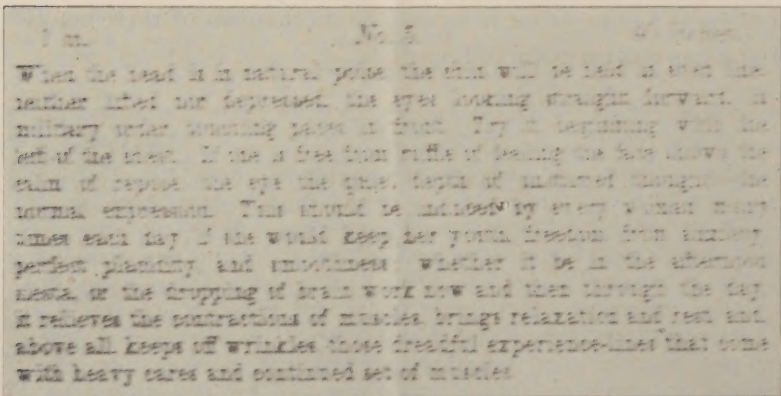


Fig. 2.—Myopic astigmatism against the rule.

The conclusion is, therefore, that the correction was made by using a horizontal strip of the lens, so narrow that there is practically no difference in its curves, hence no astigmatism.

Again the same lens is held before the eye with its axis vertical, producing an astigmatism contrary to the rule. The horizontal lines are clear and distinct and the others are in a fog. The slot is again placed before the eye horizontally, but there is no correction. The lines are the same as without it, the horizontal clear and the others misty. The eyelids are closed as be-

fore, but no correction results. A strip of lens has been isolated, but it is not the right one: the slot is held vertically before the eye and everything becomes clear, but this cannot be done with the eye-lids, and if the correction is made it must be done with the ciliary muscle, and it is just this unequal contraction of the fibres of the ciliary muscle that produces eye strain.

For further confirmation of the opinion that astigmatism according to the rule, is habitually corrected by partially closing the eyelids, a convex lens of 2 or 3 D. is placed before the eye with its axis horizontal, and it is found almost or quite impossible to read No. 1, Jaeger, without partially closing the eye-

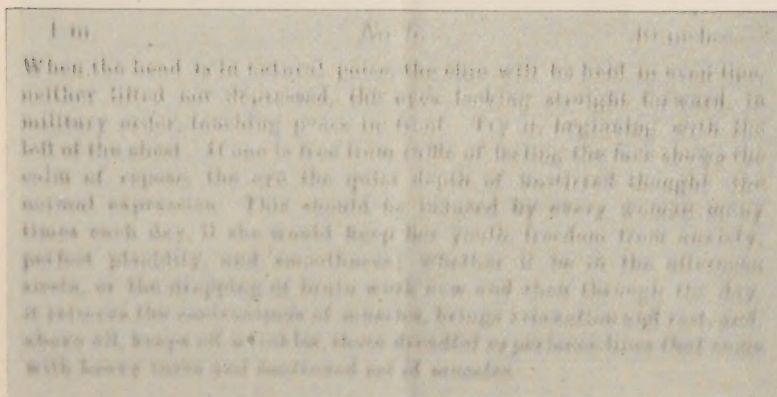


Fig. 3.—Myopic Astigmatism according to the rule.

lids, or what amounts to the same thing, holding a horizontal slot before the eye. If the convex lens is held with its axes vertical, rendering the eye astigmatic contrary to the rule, No. 1, Jaeger cannot be read with the eye open or partially closed, and the horizontal slot does no good; but the vertical slot at once clears the page. The eyelids cannot make the vertical slot.

In reading, the eyes are usually directed downward, and the lids are more or less closed, and by reason of this relation of the eyes and book, a person having slight astigmatism accord-

ing to the rule, finds no embarrassment in reading, neither is the ciliary muscle subjected to the least strain. This holds true when the astigmatism amounts to 1 or 2 D. On the other hand, a person having only a slight degree of astigmatism contrary to the rule, or in any one of the oblique angles, except perhaps within 10° of the perpendicular, will either not be able to see print at all, or will find reading very painful, if continued beyond a few minutes.

There is an apparent exception to this last statement in cases where the accommodation changes a myopic to a hyperme-

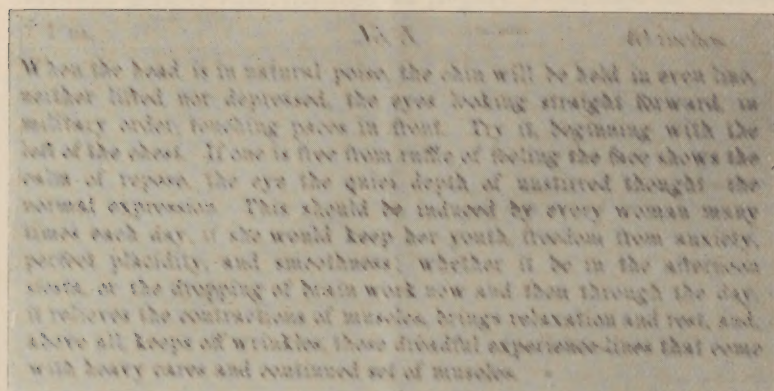


Fig. 4.—Myopic astigmatism (.50 D.) ax 45°

tropic astigmatism, thereby changing the meridian in focus 90° . Experiments made on the eyes of numerous individuals seem to show that the result of trials with the test types for near vision, are not always uniform; and as this difference is evidently due to the interference of accommodation, it was thought best for the purpose of study to get the results above described, as seen on the screen representing the retina in a schematic eye; and to make a permanent record, a sensitized plate was used. Then an ordinary camera rendered astigmatic was substituted, and photographs were taken of a few lines of print. Each photograph is marked to show the kind of astigmatism represented.

Reference to Figs. 2 and 3 will show that it is neither impossible nor very difficult to distinguish any word in either specimen: but, if a magnifying glass of one inch focus be placed over any word of four or five letters in either exhibit, in such a way that each letter is seen by itself, it is not easy to say what it is.

In reading we learn to see whole words at a glance, we do not see each individual letter. We distinguish the word by its general form, and if one-half of the surface of the word is blotted out in such a way as not to disturb its contour, it is still easy to make out. As a result of the shortening of the horizontal

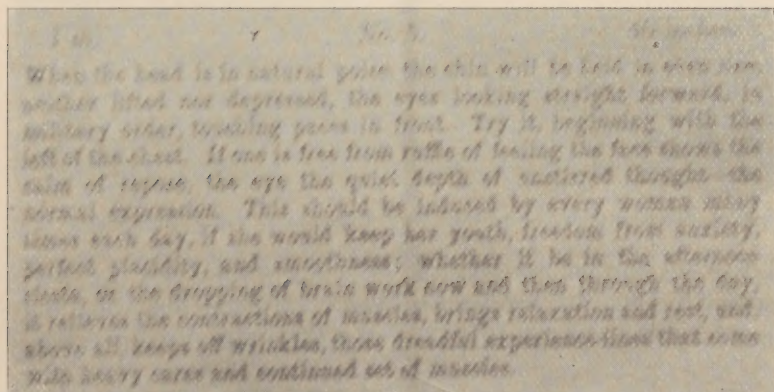


Fig 5.—Myopic astigmatism, (.50 D.) ax 135°

focus in Fig. 2, the vertical lines are seen in circles of diffusion, while the horizontal lines are clear. While in Fig. 3, the vertical lines are clear and the horizontal out of focus. It would appear that the distinguishing form of a word is better brought out by the vertical lines alone, than by the horizontal alone.

This is partially due to the fact, that the lines that are in focus, appear a little longer than they really are, and (Fig. 2) that when they are horizontal, they become a continuous line.

When the photographs 4 and 5 were taken, one end of the line was found to be higher than the other, showing the screw-

like direction of the rays, referred to by Dr. Harold Wilson, of Detroit, in his article in the *Archivers of Ophthalmology*, July, '94.

When the two cards (one representing astigmatism of 45° and the other one of 135°) are put in a stereoscope in such a way that one card is seen with the right eye and the other with the left,

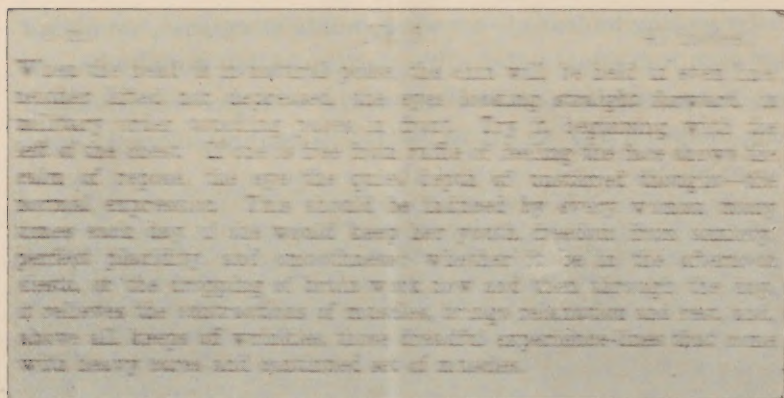


Fig. 6.—Myopic astigmatism contrary to the rule. Seen through a horizontal slot.

it is found that one end of each must be raised from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch to make the two images blend. After the blending, the ends may be carried still higher or dropped back, so as to be

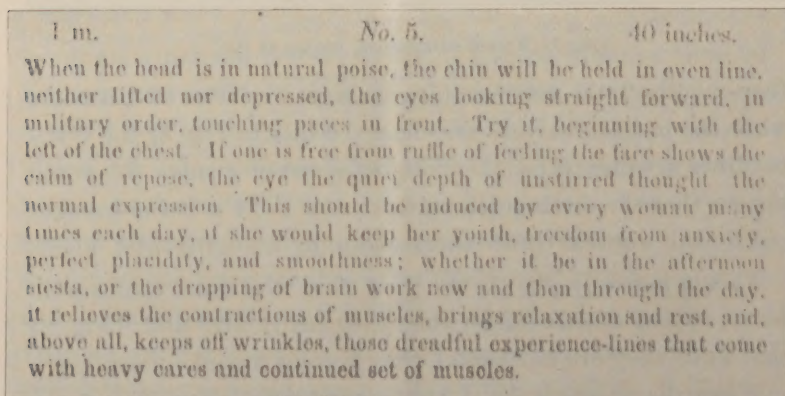


Fig. 7.—Myopic astigmatism according to the rule. Seen through a horizontal slot.

nearly parallel without separating the images. This tends to confirm the theory of Dr. Savage, that the images in symmetrical oblique astigmatism are blended by the rolling of the eyeballs on their antero-posterior axes by the action of the oblique muscles. The two cards pivoted to a third, which fits an ordinary stereoscope and arranged to move synchronously, makes a simple and inexpensive apparatus for exercise of the oblique muscles.

The fact noted by Dr. Wilson that in oblique astigmatism the projection of the vertical line is turned in a direction contrary to the horizontal, seems not to be a practical objection to the theory of Dr. Savage, as in reading we see only horizontal lines, that is, we see whole words however long, without seeing the line above or below.

